

AMENDMENTS TO THE CLAIMS

Please incorporate the following amendments to respective claims of the above-referenced application. In accordance with 37 C.F.R. §1.121, a claim listing including the status and text of all claims (as currently amended) appears below. In making these amendments, no new matter is added.

Claims 1-10. (Cancelled)

11. (Currently amended) A sensor assembly embedded in an elastomeric material, said sensor assembly comprising:

a pair of first strain sensors disposed on first opposed faces of a flexible pyramid-shaped body, said first strain sensors being deformable under a force applied by contact thereto for detecting a force in a first direction; **and**

a portion of elastomeric material in which said pair of first strain sensors and the flexible pyramid-shaped body on which said pair of first strain sensors is disposed are embedded;

wherein said first strain sensors generate corresponding output signals in response to the force in the first direction and wherein the force in the first direction is generally equal to the difference between the output signals of said first strain sensors.

12. (Original) The sensor assembly of Claim 11, further comprising:

a pair of second strain sensors disposed on second opposed faces of said body, said second opposed faces adjacent to said first opposed faces, and said second strain sensors detecting a force in a second direction generally orthogonal to said first direction;

and wherein said second strain sensors generate corresponding output signals in response to the force in the second direction, and wherein the force in the second direction is generally equal to the difference between the output signals of said second strain sensors.

13. (Original) The sensor assembly of Claim 12, wherein a sum of the first output signals and the second output signals is indicative of a force in a third direction is

orthogonal to the first and second directions.

14. (Original) The sensor assembly of Claim 11, wherein said body is made of the same material as the elastomeric material.

15. (Original) The sensor assembly of Claim 11, wherein said body has a body hardness greater than the hardness of the elastomeric material.

16. (Original) The sensor assembly of Claim 15, wherein the hardness of the elastomeric material is generally between 50 and 70 on the Shore A hardness scale.

17. (Previously provided) The sensor assembly of Claim 16, wherein said body is made of one of polyamide, urethane and epoxy.

18. (Original) The sensor assembly of Claim 11, wherein said first strain sensors are parallel plate capacitors.

19. (Original) The sensor assembly of Claim 11, wherein said first strain sensors are piezoresistive silicon strain gauges.

20. (Original) The sensor assembly of Claim 11, wherein said first strain sensors are piezoelectric devices.

21. (Original) The sensor assembly of Claim 20, wherein at least one of said piezoelectric devices is one of PZT, ZnO, and PVDF.

22. (Original) The sensor assembly of Claim 11, wherein said first strain sensors are interdigitated finger capacitors.

23. (Original) The sensor assembly of Claim 13, further including a plurality of sensor assemblies embedded in an object in a mutually spaced relationship.

Claims 24-28. (Cancelled)

29. (Currently Amended) The sensor assembly of Claim 11, wherein **the said portion of** elastomeric material comprises a tire.

30. (Previously presented) A process of embedding a sensor in an elastomeric material, the process comprising:

providing a three-axis sensor assembly including two pairs of strain gauges, a

first pair disposed on first opposed faces of a pyramid-shaped body so as to detect strain applied directly to said first pair of sensors in a first direction, and a second pair disposed on second opposed faces of the pyramid-shaped body so as to detect strain applied directly to said second pair of sensors in a second direction; and

adjusting the aspect ratio of the pyramid-shaped body to a sensitivity of the three-axis sensor.

31. (Previously presented) The process of Claim 30, further including the step of adjusting the hardness of the pyramid-shaped body relative to the elastomeric material.

32. (Original) The process of Claim 30, wherein the sensor is introduced to the elastomeric material when the elastomeric material is in an uncured state.

33. (Previously presented) The process of Claim 30, further including the step of encapsulating the first and second pairs of strain gauges in a second material different than the elastomeric material.

34. (Original) The process of Claim 33, further including the step of selecting a ratio of elastic moduluses between the elastomeric material and the second material.

35. (Original) The process of Claim 34, wherein the second material is one of polyimide and epoxy.

36. (Previously presented) The process of Claim 35, further including the step of coupling the strain gauges to the body with an adhesive.

37. (Previously presented) The process of Claim 36, further including the step of potting the sensor assembly in a third material.

38. (Previously presented) The process of Claim 37, wherein the adhesive and the third material are the same.

39. (Previously presented) The process of Claim 30, further including the step of placing a topping layer on the sensor assembly so as to scale strain forces sensed by the strain gauges.

Claims 40-44. (Cancelled)

45. (Previously presented) A process of embedding a sensor in an elastomeric

material, the process comprising:

providing a three-axis sensor assembly including first and second pairs of strain sensors, the first pair disposed on first opposed faces of a pyramid-shaped body so as to detect strain in a first direction applied directly to the first pair of sensors, and the second pair disposed on second opposed faces of the pyramid-shaped body so as to detect strain in a second direction applied directly to the second pair of sensors; and
placing the sensor assembly in the elastomeric material when the elastomeric material is in an uncured state.

46. (Previously presented) The process of Claim 45, further comprising the step of adjusting the aspect ratio of the pyramid-shaped body according to a sensitivity of the sensor assembly.

47. (Previously presented) The process of Claim 45, further comprising the step of encapsulating the first and second pairs of strain sensors.

48. (Previously presented) The process of Claim 47, wherein said encapsulating step includes using a second material different than the elastomeric material.

49. (Previously presented) The process of Claim 48, further comprising the step of selecting a ratio of elastic moduluses between the elastomeric material and the second material.

50. (Previously presented) The process of Claim 49, wherein the second material is one of polyimide and epoxy.

51. (Previously presented) The process of Claim 48, further including the step of coupling the strain sensors to the pyramid-shaped body with an adhesive.

52. (Previously presented) The process of Claim 51, further including the step of potting the sensor assembly in a third material.

53. (Previously presented) The process of Claim 52, wherein the elastomeric material, the second material, the third material and the adhesive are different.

54. (Previously presented) The process of Claim 52, further including the step of placing a topping layer on the sensor assembly so as to scale strain forces sensed by the strain sensors.

55. (Previously presented) The process of Claim 45, further comprising the step of

adjusting the hardness of the pyramid-shaped body relative to the elastomeric material.

56. (Previously presented) The process of Claim 45, further comprising the step of coupling the pyramid-shaped body to a printed circuit.

57. (Previously presented) The process of Claim 56, wherein the printed circuit board is flexible.

58. (Previously presented) The process of Claim 56, wherein the printed circuit includes a substrate and said coupling step includes coupling the pyramid-shaped body to the substrate.

59. (Previously presented) The process of Claim 58, wherein the substrate comprises a silicon IC.

60. (Previously presented) The process of Claim 59, wherein the substrate further comprises one of a polyimide and an epoxy.

61. (Previously presented) The process of Claim 60, further comprising the step of electrically coupling the strain sensors to the printed circuit board.

62. (Previously presented) The process of Claim 58, wherein the substrate includes generally planar top and bottom surfaces, and the pyramid-shaped body is coupled to the top surface.

63. (Previously presented) The process of Claim 62, further comprising the step of disposing an integrated circuit on the bottom surface when the strain sensors are piezoelectric strain sensors.

64. (Previously presented) The process of Claim 63, further comprising the step of electrically coupling the integrated circuit to the printed circuit.

65. (Previously presented) The process of Claim 63, wherein the integrated circuit is displaced from the pyramid-shaped body.

66. (Previously presented) The process of Claim 63, wherein the integrated circuit includes a buffer amplifier.

67. (Previously presented) The process of Claim 45, further comprising the step of coupling the resistive strain sensors to the opposed faces with an adhesive.

68. (Previously presented) The process of Claim 67, wherein the adhesive is an epoxy.

69. (Previously presented) A three-axis sensor assembly embedded in an elastomeric material that measures strain forces on the elastomeric material, the sensor assembly comprising:

a three-axis sensor assembly including two pairs of strain sensors, a first pair disposed on first opposed faces of a pyramid-shaped body so as to deform in response to strain in the elastomeric material transmitted directly to said first pair in a first direction, and a second pair disposed on second opposed faces of the pyramid-shaped body so as to deform in response to strain in the elastomeric material transmitted directly to said second pair in a second direction;

a printed circuit responsive to the outputs of said strain sensors to generate a corresponding signal indicative of the corresponding strain acting on the elastomeric material; and

wherein the sensor assembly is electrically coupled to the printed circuit.

70. (Previously presented) The three-axis sensor assembly of Claim 69, wherein the strain sensors are resistive strain sensors.